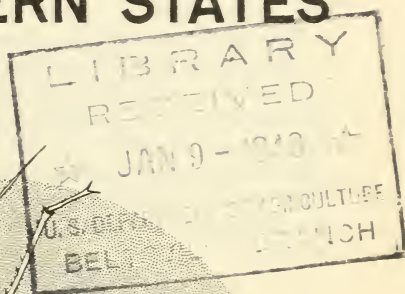
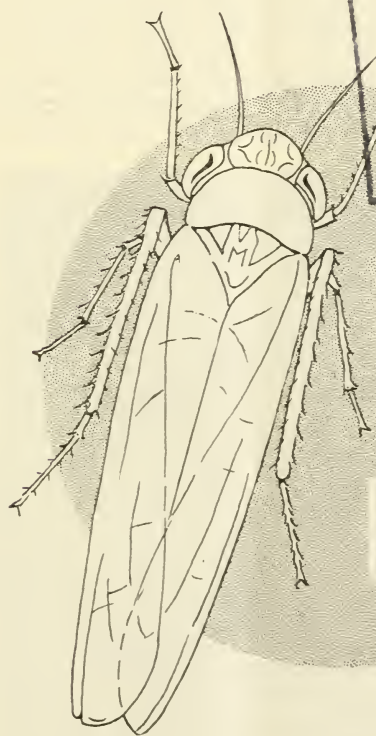


Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

The Potato Leafhopper

A PEST OF ALFALFA
IN THE EASTERN STATES



Leaflet
No. 229

U. S. DEPARTMENT OF AGRICULTURE

THE POTATO LEAFHOPPER, A PEST OF ALFALFA IN THE EASTERN STATES

By F. W. Poos, senior entomologist, Division of Cereal and Forage Insect Investigations, Bureau of Entomology and Plant Quarantine

THE potato leafhopper (*Empoasca fabae* (Harris)) is one of the most important insect pests attacking alfalfa in the eastern half of the United States. It occurs throughout the United States, with the possible exception of the Northwest, and during seasons of abundance it is responsible for considerable loss in the quantity and quality of alfalfa produced.

The potato leafhopper damages not only forage legumes but various other crops such as beans, potatoes, and deciduous nursery stock. It has been found breeding on over 100 distinct species of plants. It often migrates in considerable numbers from a maturing or harvested crop to some other crop in a more succulent condition, and this complicates the application of measures necessary for satisfactory control. The recommendations for control of the insect as given in this leaflet are intended to apply principally to the eastern half of the United States.

Description and Habits of the Potato Leafhopper

The potato leafhopper (fig. 1, A) is a wedge-shaped, small, pale-green insect about one-eighth of an inch in length when fully grown.

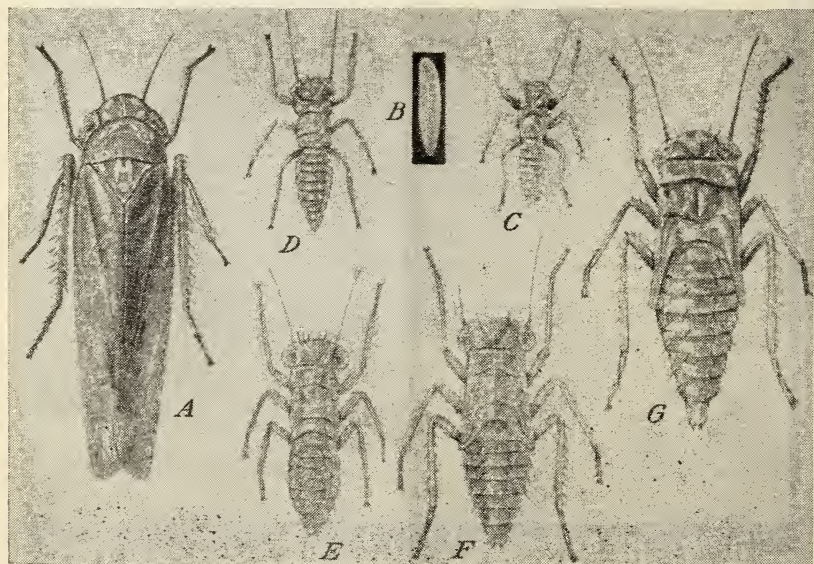


FIGURE 1.—The potato leafhopper: A, Adult; B, egg; C to G, first to fifth instars, or immature stages. Much enlarged. (After Fenton and Hartzell.)

It feeds largely on the petioles and lower surface of the leaves. It is inconspicuous and extremely active, jumping or flying when disturbed. The young, or immature stages (fig. 1, *C* to *G*), as well as the adults, can run backward or sideways as rapidly as they can move forward. Therefore it is not remarkable that many people are unfamiliar with this insect, for when they look for it on one surface of a leaf it frequently darts around to the opposite side before it can be seen. The adult insects fly or jump up in great numbers, however, when heavily infested alfalfa is disturbed; and when such alfalfa is being cut, particularly during July and August, they sometimes cause much annoyance to operators of the mowing machines.

The Damage It Causes

The potato leafhopper injures alfalfa by piercing the leaves and petioles with its beak and sucking the juices. This injury results in a yellowing and dwarfing of the foliage and decreases the quality as well as the quantity of hay made from heavily infested alfalfa. In the early stages the injury is characterized by shades of pink beginning at the midrib of the leaf, whereas injuries resulting from various other causes often start at the leaf margin. When the tender petioles are heavily attacked by one or more individuals, the foliage supported by such petioles often becomes severely wilted (fig. 2). This diseaselike



FIGURE 2.—Wilted leaf of hairy Peruvian alfalfa at left; wilting caused by feeding of one potato leafhopper confined to the petiole for 46 hours.

injury is often referred to as "yellows," or "yellow top," but it seems preferable to refer to it as potato leafhopper injury because various shades of pink, red, and purple, as well as yellow, are usually present. Other types of yellowing, sometimes difficult to distinguish from the advanced stages of potato leafhopper injury but caused by virus or bacterial diseases or by certain nutritional deficiencies, may also be present.

Its Seasonal Activity

In the vicinity of Washington, D. C., during the period 1932-42, the earliest date of spring appearance of the potato leafhopper was April 19, although the normal time is about May 5 to 7. The insect apparently does not hibernate, since it has not been found overwintering north of the Gulf States, where it breeds continuously throughout the winter. It appears to migrate northward in early spring with the warm winds from the South and, along the Atlantic seaboard, depends for food mainly on young oak and hickory foliage to build up its migrating populations. Warm, damp weather and ample, succulent food provide ideal conditions for its propagation, and it can build up to enormous numbers within a comparatively short time. The greatest injury to alfalfa is generally done to the second crop, during July, but severe injury to the third crop has often been observed.

Its Life History

The potato leafhopper lays its slender white eggs (fig. 1, *B*) within the stems and larger veins of the leaves, and during the summer the eggs usually hatch within 6 to 9 days. At first the young leafhoppers are nearly white, but they soon become pale green as they develop through the four succeeding immature stages (fig. 1, *D* to *G*) of their life cycle. They shed their skins at the end of each stage and after the fifth stage they have wings and are full grown. The wings are usually a paler green than the rest of the body. Mating takes place soon after the adults appear, and within a few days eggs are deposited and a new life cycle begins. The period required for this insect to develop from egg to adult, under most favorable conditions, is about 3 weeks.

Studies under controlled conditions in an outdoor insectary at Arlington Experiment Farm, Arlington, Va., showed that six generations were produced in the period from May to October, inclusive. Under field conditions the generations overlap and cannot be definitely distinguished.

The Losses It Causes to the Alfalfa Crop

The losses caused by the potato leafhopper to alfalfa in the eastern half of the United States apparently have been far more extensive than has been realized. Much of the loss is in young stands, where the injury permits weeds and grasses to crowd out the alfalfa. It seems probable also that alfalfa is frequently so severely weakened by this leafhopper during the summer that it is unable to survive the following winter.

Tests of injury caused by the potato leafhopper were made in cages covered with tobacco cloth during the period of development of the

second and third crops during four seasons. In these tests a moderate to heavy infestation of this insect caused a loss in weight of air-dried hay ranging from 14 to 27 percent and averaging 23 percent. Although conditions in these studies were not wholly comparable with those occurring naturally in the field, the consistent results obtained during four seasons appear to be significant. They indicate that alfalfa which has been moderately to severely injured by this pest during one season does not become entirely normal by the time the first cutting is made the next spring, and that potato leafhopper injury to alfalfa is apparently more important in reducing the stand when other factors are unfavorable to vigorous growth of the crop than when they are favorable.

Hay made from alfalfa moderately to severely infested by this insect is reduced in quality as well as quantity. The hay taken from the infested cages was graded as U. S. No. 2, leafy, and that taken from uninfested cages as U. S. No. 1. The price of U. S. No. 2 alfalfa hay averaged \$2.59 per ton lower than U. S. No. 1 on the Kansas City market during the 7-year period 1930-36. Chemical analyses of samples have indicated that hay made from alfalfa moderately to severely injured by the potato leafhopper is lower in protein and higher in carbohydrates than hay made from normal, green alfalfa. Investigators have also reported that only about half as much carotene was found in leafhopper-injured alfalfa as in the green alfalfa. It is therefore only about half as rich in materials from which vitamin A is produced.

Natural Enemies of the Potato Leafhopper

Spiders, mites, certain predaceous insects, and the common fungus disease *Entomophthora sphaerosperma* have been observed to destroy both the immature forms and the adults of the potato leafhopper, but none of these is sufficiently abundant to be relied upon for satisfactory control.

Aids in Controlling the Potato Leafhopper

There are several ways of reducing potato leafhopper injury to alfalfa in the eastern half of the United States. Naturally, the best method or combination of methods for use on any particular farm will be determined by consideration of effectiveness, practicability, and economy.

The application of small amounts of boron to the soil has been recommended, and where soils are deficient in this element the addition of small quantities has greatly improved the vegetative growth of alfalfa. The potato leafhopper has been observed to injure alfalfa severely, however, even where boron had been applied to the soil. Furthermore, recent studies under controlled laboratory conditions have shown no significant difference in the populations of potato leafhoppers reared on alfalfa plants grown with and without the addition of boron.

No variety or strain of alfalfa outstanding in its resistance to potato leafhopper injury has been developed, although some selections are somewhat more resistant than others. The type and amount of hairiness present on different varieties does not appear to be related to the injury that develops. In general, the hardy varieties that have been found best adapted to the locality should be grown.

Planting Alfalfa as Far as Possible from Other Favorite Host Plants

In planning crop rotations the alfalfa should be located as far as possible from large plantings (larger than garden plantings) of beans, potatoes, or other favorite hosts plants of this insect, which mature, or are likely to be harvested, at a time when this pest would migrate from such crops to the alfalfa and injure it. The planting of a 30-foot strip of a cereal or grain between alfalfa and preferred host crops will prevent noticeable injury by the migrating immature forms of the potato leafhopper.

Regulating Times of Cutting so as To Avoid Injury

Much of the injury to alfalfa by this pest can often be avoided by varying to some extent the time of cutting. In general, however, at least 45 days should elapse between cuttings. Too frequent cutting, or premature cutting because the crop begins to become discolored, regardless of the other factors involved, should be avoided if a profitable stand is to be maintained.

A delay of from 10 days to 2 weeks in cutting the first crop, if the quality of the hay is thereby not too much impaired, is often a practical measure in keeping populations of this insect to a minimum on alfalfa, because by that time large numbers of migrating adults will have deposited their eggs in the first crop. Those eggs that have not hatched will be taken away in the hay, and the immature forms that have hatched may die of starvation because they are too small to migrate to other food plants and complete their development.

On the other hand, if cutting is delayed until much new growth appears at the crowns of the plants, the young, tender shoots will enable the immature leafhoppers to continue their development to the adult stage and heavily reinfest the next alfalfa crop. For this reason a delay in the cutting of the crop until after the normal time on account of unfavorable weather, pressure of other farm work, or some other factor may result in uniformly heavy infestation of the next crop and injury to it.

Sometimes the grower cuts part of his field and unfavorable weather or other factors prevent completion of the harvesting (fig. 3). In such case the leafhoppers migrate from the cut to the uncut area and usually cause extreme injury, particularly along the first 15 to 30 feet of the uncut area. If harvesting of the remainder of the crop is delayed for as long as 7 to 10 days, or longer, these insects will return to the newly developing alfalfa in the earlier-cut portion of the field.

Control with Insecticides

Losses in yield of alfalfa hay have been prevented on small field plots by making a single application of a pyrethrum-oil spray or a pyrethrum-sulfur dust mixture. Small field plots of alfalfa to which these materials had been applied at the proper time to control this insect have yielded as much as 28 percent more of air-dried hay than adjacent untreated plots.

In tests on $\frac{1}{10}$ -acre alfalfa plots, application of a pyrethrum-sulfur dust mixture at the rate of about 25 pounds to the acre by means of a rotary hand duster killed approximately 98 percent of the potato



FIGURE 3.—Potato leafhopper damage to alfalfa cut at different times. *A*, Most of this field was cut July 14, but the central, dark area was cut July 25; photographed August 28. *B*, Plants from part of field that was cut first; *C*, plants from yellow border surrounding central dark area; *D*, representative plants from central dark area.

leafhoppers under field conditions. This dust mixture contained the following ingredients:

Active ingredients:		Percent
Pyrethrins	0.0825
Petroleum hydrocarbons6875
Sulfur (98 to 100 percent of which will pass through a 325-mesh screen)	66.00
Inert ingredients	33.23

A single application of this material, if applied under favorable weather conditions and if accompanied by good growing conditions for at least 2 weeks prior to alfalfa-harvesting time, may often be the deciding factor in producing a normal crop of green alfalfa instead of a small crop of yellowed alfalfa of inferior quality.

When there is a heavy attack on new growth of alfalfa approximately 3 to 6 inches in height, an application of the dust mixture should be made as soon as the leafhoppers begin to cause considerable wilting of the young foliage (fig. 2). On alfalfa of this height less than 25 pounds of dust per acre should suffice, but for injury that develops later to taller alfalfa and shows symptoms such as those described on p. 3, the full dosage would be required.

The equipment used to apply insecticidal dusts to other field crops can undoubtedly be adapted for use in controlling the potato leafhopper on alfalfa when heavy infestations of this insect are present.

Because of the insect's habit of concealing itself, the grower should not rely merely on general observations in determining its abundance. If there is doubt as to whether this pest is causing the injury, the alfalfa should be swept with an insect-collecting net. The numbers of potato leafhoppers collected under ordinary conditions in 5 collections of 20 sweeps each from different parts of the field will show accurately enough the abundance of this insect in a given field. The capture of 1 potato leafhopper per sweep, taken under favorable collecting conditions, would indicate an infestation that could cause considerable injury to the alfalfa within 3 weeks.

